IN THE CLAIMS

Claims 1-28 (canceled)

29. (currently amended) A method of characterizing conditions in a tissue, comprising (a) providing a catheter that has a light source that emits light in selected wavenumbers within the range of mid-IR spectrum; (b) directing the light from the catheter to an area of tissue at a location inside a blood vessel of a subject; (c) collecting light reflected from the location and generating a reflectance spectra; and (d) comparing said reflectance spectra to a reference spectra of normal tissue, whereby a location having an increased number of absorbance peaks at said selected wavenumbers indicates a tissue inside said blood vessel containing a physiological marker for atherosclerosis, wherein the comparing step comprises that increased numbers of absorbance peaks at said selected wavenumbers are within at least one range of mid-infrared wavenumbers selected from the group of: about 3800-3000 cm^{-1}, about 3500-3000 cm^{-1}, about 3020-3000 cm^{-1}, about 1520-1500 cm^{-1}~~about 3500-3000, about 3020-3000, about 2950-2800, about 1800-1450, about 1710-1760, about 1690-1610, about 1520-1500, about 1480-1450, about 1100-900 and about 900-400 cm^{-1}~~.

30. (currently amended) A method of characterizing conditions in a tissue, comprising (a) providing a catheter that has a light source that emits light in selected wavenumbers within the range of mid-IR spectrum; (b) directing the light from the catheter to an area of tissue at a location inside a blood vessel of a subject; (c) collecting light reflected from the location and generating a reflectance spectra; and (d) comparing said reflectance spectra to a reference spectra of normal tissue, whereby a location having an increased number of absorbance peaks at said selected wavenumbers indicates a tissue inside said blood vessel containing a physiological marker for atherosclerosis, wherein the comparing step comprises that increased numbers of absorbance peaks at said selected wavenumbers is in the range of wavenumbers 4000 to 400 cm^{-1}, wherein at least one peak is at about 3300 cm^{-1}, about 3005 cm^{-1}, or about 1515 cm^{-1}.

31. (canceled)

32. (currently amended) The method of claim 29 wherein the comparing step comprises that increased numbers of absorbance peaks at said selected wavenumbers are in the range between about 3000-3100 cm^{-1}~~and between about 1710-1760 cm^{-1}~~.

33. (previously presented)The method of claim 29, further comprising the step of generating a spatially resolved map of reflectance generated spectral signals from different locations within a single vessel.

34. (currently amended) An apparatus for characterizing tissue conditions, comprising: (a) a single or multiple source of mid-IR light covering a range of mid-infrared wavenumbers; (b) a catheter coupled to said source and a detector to detect light reflected by tissue of a blood vessel of a subject; (c) a computer means for generating the reflectance generated spectra at selected wavenumbers detected by said detectors and containing the generated spectra to a reference spectra of normal tissue, to determine whether the subject has atherosclerosis, wherein said computer means has stored therein the reference spectra in the wavenumber range of 4000-400 cm^{-1} and wherein said reflectance generated spectra at said selected wavenumbers are within at least one range of mid-infrared wavenumbers selected from the group of: about 3800-3000 cm-1, about 3500-3000 cm-1, about 3020-3000 cm-1, about 1520-1500 cm-1.

35. (currently amended) The apparatus of claim 34, wherein said computer means has stored therein ~~the reference wavenumber range of 4000-400 cm^{-1}~~ at least one of the following reference wavenumber ranges, expressed in cm^{-1}: about 4000-2800, about 3500-3000, about 3020-3000, about 2950-2800, about 1760-1710, about 1690-1610, about 1520-1500, about 1480-1450, and about 1100-900 and about 900-400.

36. (currently amended) The apparatus of claim 35, wherein said computer means has stored therein at least one of the following reference wavenumber ranges, expressed in cm^{-1}: ~~about 4000-2800,~~ about 3500-3000, about 3020-3000, ~~about 2950-2800, about 1760-1710, about 1690-1610,~~ and about 1520-1500~~, about 1480-1450, and about 1100-900 and about 900-400~~.

37. (previously presented)The apparatus of claim 34, further comprising an interferometer.

38. (previously presented)The apparatus of claim 34, wherein said catheter comprises a source fiber and a detection fiber having a tip or a tip array.

39. (previously presented)The apparatus of claim 34, further comprising a tuning system for said source.

40. (previously presented)The apparatus of claim 34, further comprising a cooling means for said detector.

41. (previously presented)The apparatus of claim 40, further comprising the additional use of customized bandwidth and special gain for DC- and/or AC-coupled preamps for the detectors to increase the signal-to-noise ratio of the detectors.

42. (currently amended) A method of characterizing atherosclerotic biological material that has enhanced reflectance and/or spectral features, comprising the steps of: (a) providing light in selected mid-IR wavenumbers between about 4000 to about 400 cm^{-1}; (b) directing the light through a probe to an area of said biological material; (c) measuring reflected light returning through the probe over a range of said wavenumbers to generate a pattern of spectral signals representative of said area; and (d) comparing spectral signals from a reference spectra to the spectral signals from said area for enhanced reflectance and/or spectral features, wherein said range is selected from the group of: about 3800-3000 cm^{-1}, about 3500-3000 cm^{-1}, about 3020-3000 cm^{-1}, about 1520-1500 cm^{-1}, whereby an increase in spectral signals in said range of wavenumbers indicates the biological material is atherosclerotic.

43. (currently amended) A method of spectroscopic diagnosis of tissue comprising: irradiating a subsurface portion of tissue at a target area in the blood vessel of a subject with radiation having a frequency within the mid-infrared range, transmitted through a fiber optic cable; detecting light reflected by the area of tissue in response to the radiation, the light having a range of 4000 cm^{-1} to 400 cm^{-1}; and analyzing the detected reflectance light to diagnose whether the tissue is atherosclerotic including the step of comparing the detected light with reference data, wherein said detected reflectance light is analyzed in at least one of the following wavenumber ranges: about 3800-3000 cm^{-1}, about 3500-3000 cm^{-1}, about 3020-3000 cm^{-1}, about 1520-1500 cm^{-1}.

44. (previously presented)The method of claim 43, wherein the detecting step further comprises collecting the reflected light through the fiber optic cable.

45. (previously presented)The method of claim 43, wherein the irradiation step further comprises a catheter means for insertion of the fiber optic cable in body lumens.

46. (previously presented)The method of claim 43, wherein the fiber optic cable receives light reflected by the tissue and transmits the reflected light to a spectroscopic analysis system.

47. (previously presented)The method of claim 43, further comprising an alternate spectrophotometer to receive the reflected light.

48. (previously presented)The method of claim 43, further comprising the step of rotating the fiber optic cable radially within the blood vessel, whereby data is acquired at various target locations radially within the lumen.

49. (previously presented)The method of claim 48, wherein the steps are repeated thereby performing a 360-degree spectral analysis of the body lumens.

50. (previously presented)A method of detecting atherosclerotic conditions in a blood vessel tissue of a subject comprising the steps of: delivering mid-infrared light to a tissue to be diagnosed, irradiating said blood vessel tissue with said light, detecting any delivered light reflected by any atherosclerotic tissue within the same range as the mid-infrared delivered light, and determining the chemical composition and cellular conditions in atherosclerotic tissues.